

Recent Introductions for Biological Control in Hawaii—VII

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This paper includes a list of new introductions and additional releases of beneficial organisms for biological control in Hawaii made since the last published listing (Davis, 1961) and gives a few notes on the status of organisms recently introduced for the control of snail, weed and insect pests.

Snail Pest Control

A. *Lymnaea ollula* Gould (Liverfluke snail)

Sepedon macropus Walker: This snail-killing fly continued to flourish in most of the original release points. The number of empty liverfluke snail shells appears to be increasing and strongly suggests effective predation by this species.

Sciomyza dorsata Zetterstedt: Although the propagation of this marsh fly was successful with thousands released throughout the state, no recoveries were made, and breeding was discontinued.

Sepedon praemiosa Giglio-Tos, *Atrichomelina pubera* (Loew), and *Pherbellia grisescens* (Meigen) are the most recent liverfluke snail predators received from Dr. Clifford O. Berg. They were liberated on Oahu, Hawaii and Kauai. Although no recoveries were made, it is too early to expect this.

B. *Achatina fulica* Bowdich (Giant African snail)

Gonaxis quadrilateralis (Preston): This carnivorous snail now appears to be the most effective predator of the African snail. Outstanding populations were observed at a number of release points, particularly at Tantalus Drive on Oahu. In the past two years over 5,000 *G. quadrilateralis* were removed from this release point and distributed to African snail-infested localities.

Weed Pest Control

Introduced insects for the control of lantana, *Lantana camara* var. *aculeata* (Moldenke), continued to exert considerable stress on this range weed, particularly in areas of the state having less than 40 inches of rainfall. In order of importance these were as follows: *Hypena strigata* Fabricius (formerly known in Hawaii as *H. jussalis* Walker), *Teleonemia scrupulosa* Stål, *Syngamia haemorrhoidalis* Guenée, and *Catabena esula* Druce.

Cocoons of the noctuid, *C. esula*, were very abundant in the Puu Lapo Paddock of Kahua Ranch, Hawaii earlier in the year, as many as 15 being found on one plant. In October 1961, the first seasonal appearance of larvae was observed at Kukui Paddock, Kau District, Hawaii and the first appearance of caterpillars on Oahu was noted near the Honouliuli Forest Reserve in November.

These observations tend to confirm the seasonal span of *C. esula*. This noctuid is believed to be the dominant defoliator of lantana in some localities during this period.

Control of lantana in the wetter areas of the state seemed promising with the discovery of exit holes of the destructive Mexican stem-and root-boring cerambycid, *Plagiobammus spinipennis* Thompson, at Kukui Paddock, Kau District and considerable girdling and boring activity on the Greenwell Ranch, Kona District. These observations were made in November.

With excellent progress of the biological control of *Emex spinosa* and *E. australis*, by *Apion antiquum* Gyllenhal on the Parker Ranch, Hawaii, large numbers of this South African leaf-feeding and stem-boring weevil were transferred to Maui in March. At least three local generations were obtained before the demise of this annual weed. The establishment of *A. antiquum* appears assured.

The flower-feeding tephritid, *Acinia fucata* Fabricius, which was introduced from Guatemala for the control of sour bush, *Pluchea odorata*, and which is well established on Oahu, was liberated and established on Kauai and Maui.

Insect Pest Control

Apanteles militaris (Walsh) was recovered for the first time at Kamuela, Hawaii in May. This braconid was introduced for the control of the cosmopolitan armyworm, *Pseudaletia unipuncta* Haworth, and is considered as one of the most effective parasites of this armyworm species.

Miscellaneous

The exploratory phase of the biological program was carried on by the junior author and the propagation and testing of all organisms considered for liberation were conducted by the senior author, assisted by Harry Nakao and Mabel Chong. The assistance of collaborators and determinations by the Insect Identification and Parasite Introduction Section, United States Department of Agriculture are gratefully acknowledged.

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TABLE 1. NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII
1961

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd (1961)	Number ***	***Release Point
I SNAIL PESTS						
<i>Bradybaena similaris</i> (Ferrusac)	<i>Streptaxis contusus</i> (Ferrusac) (Pulmonata: Streptaxidae)	Rio de Janeiro, Brazil	N.L.H. Krauss	24 May	18	Kapaa, Kauai
<i>Achatina fulica</i> Bowdich (Giant African Snail)	* <i>Damaster blaptoides blaptoides</i> Kollar (Coleoptera: Carabidae)	Fukuoka, Japan	K. Yasumatsu	26 May	79	Kaneohe, Oahu
<i>Lymnaea ollula</i> Gould (Liver fluke snail)	<i>Sepedon praemiosa</i> Giglio-Tos (Diptera: Sciomyzidae)	Los Angeles County, Calif.	C.O. Berg	30 Oct.	110	Kukuihaele, Hawaii
	<i>Atrichomelina pubera</i> (Loew) (Diptera: Sciomyzidae)	Ithaca, New York	C.O. Berg	21 Sept.	100	Kukuihaele, Hawaii
	<i>Pherbellia grisescens</i> (Meigen) (Diptera: Sciomyzidae)	Los Angeles County, Calif.	C.O. Berg	21 Sept.	75	Kukuihaele, Hawaii
II WEED PESTS						
<i>Lantana camara</i> var. <i>aculeata</i> (L.) Moldenke (Lantana)	* <i>Aerenicopsis championi</i> Bates (Coleoptera: Cerambycidae)	Vera Cruz, Mexico	E. Jimenez	1 Jun.	22	Makiki Round Top Drive, Oahu
	* <i>Plagiobammus spinipennis</i> Thomson (Coleoptera: Cerambycidae)	Jalapa area, Vera Cruz State, Mexico Jalapa area, Vera Cruz State, Mexico	N.L.H. Krauss E. Jimenez	20 Mar. 12 May 19 May 23 May	53 73 98 90	Kukui Paddock, Kau, Hawaii Kahauloa, Kona, Hawaii

TABLE 1. (Cont.) NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII
1961

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd (1961)	Number ***	***Release Point
<i>Lantana camara</i> var. <i>aculeata</i> (L.) Moldenke (<i>Lantana</i>) (cont.)	<i>Uroplata girardi</i> Pic (Coleoptera: Hispididae)	Vitoria, Espirito Santo, Brazil	N.L.H. Krauss	21 Dec.	50	Lawai Valley, Kauai
<i>Schinus terebinthifolius</i> Raddi	* <i>Bruchus atronotatus</i> Pic (Coleoptera: Bruchidae)	Sao Paulo, Brazil	N.L.H. Krauss	25 Apr.	285	Kiolakaa, Kau, Hawaii
	<i>Crasimorpha</i> sp. (Twig gall moth) (Lepidoptera: Gelechiidae)	Recreio dos Bandeirantes, Guanabara, Brazil	N.L.H. Krauss	13 Dec.	15	Kiolakaa, Kau, Hawaii
<i>Ulex europaeus</i> L. (Gorse)	<i>Apion scutellare</i> Kirby (Coleoptera: Curculionidae)	Melacas, Portugal	F.A. Silva	31 Aug.	63	Olinda, Maui
		Almoinhas (Ponte de Sor-Alentejo), Portugal	F.A. Silva	20 Sept.	113	Olinda, Maui
<i>Elephantopus mollis</i> HBK	<i>Tetraeuaesta obscuriventris</i> (Loew)	Suva, Fiji	B.A. O'Connor	4 Dec.	200	Princeville Ranch, Kauai
<i>Elephantopus scaber</i> L.	(Diptera: Tephritidae)			12 Dec.	500	Hamakua, Hawaii
III INSECT PESTS						
<i>Macrosiphum pisi</i> (Harris)	** <i>Aphidius smithi</i> Sharma & Rao (Hymenoptera: Braconidae) Introduced by H.S.P.A. Exp. Sta.)	Albany, California	Glenn Finney	1 Jan.	777	Kekaha, Kauai
<i>Pseudaletia unipuncta</i> Haworth	* <i>Damaster blaptoides</i> <i>blaptoides</i> Kollar (Coleoptera: Carabidae)	Fukuoka, Japan	K. Yasumatsu	1 May 15 May	31 103	Kamuela, Hawaii Kokee, Kauai

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<i>Phytobia maculosa</i> Malloch	<i>Chrysocharis majoriani</i> Girault (Hymenoptera: Eulophidae)	Santos and Sao Vicente, Sao Paulo, Brazil	N.L.H. Krauss	18 Sept.	16	Makiki Nursery, Honolulu
	<i>Achrysocharis</i> sp. (Hymenoptera: Eulophidae)	Santos and Sao Vicente, Sao Paulo, Brazil	N.L.H. Krauss	18 Sept.	16	Makiki Nursery, Honolulu
	<i>Opius</i> sp. nr. <i>oscindis</i> (Ashmead) & <i>Opius</i> sp. (Hymenoptera: Braconidae)	Santos and Sao Vicente, Sao Paulo, Brazil	N.L.H. Krauss	29 Aug.	7	Makiki Nursery, Honolulu
		Santos and Sao Vicente, Sao Paulo, Brazil	N.L.H. Krauss	29 Aug.	4	Makiki Nursery, Honolulu
<i>Siphona irritans</i> L. (Hornfly)	* <i>Bubulcus ibis</i> L. (Cattle egret) (Aves: Ardeidae)	Miami, Florida	C. Bundy	25 June	38	Honouliuli, Oahu
IV RODENTS	* <i>Tyto alba</i> Scopoli (Barn owl) (Aves: Aluconidae)	San Diego Zoo		3 Nov.	2	Waimea Valley, Kauai
V MISCELLANEOUS	<i>Iron lagunitas</i> Traver <i>Heptagenia rubroventris</i> Traver (Ephemera: Ecdyoniuridae)	California	Needham Usinger & Shimizu	7 Aug.	Eggs	Kokee, Kauai

* Previously Introduced.

** Introduced by Entomology Dept., H.S.P.A. Exp. Sta.

*** Applies to Initial Releases Only.